New acoustic sensor for injection molds

In-mold sensors are useful, but hardly applied because they are often too expensive, the space is limited or they are not robust enough (wires in mold!). That’s our motivation!

We, the Chair of Polymer Processing in close collaboration with the Chair of Automation and the Industrial Liaison Department have made it our task, to make in-mold sensors more robust and cost-effective to gain process information from the mold. Be a part of it!

Application of new sensor
- Detection of melt front for:
  - Definition of switchover point
  - Balancing of runner systems in multi-cavity molds
  - Checking of (in)complete filling
  - Trigger for cascade injection molding
- Potential detection of other unusual events in mold (related to wear or damage)

Advantages of acoustic sensor principle
- Purely mechanical principle in mold ⇒ reduced maintenance
- Wireless inside the mold ⇒ robust
- Sensitive sensor (microphone) on mold outside surface not subject to high melt temperature & pressure
- Multiple signals from multiple locations in the mold detectable with one sensor
- Fast response time
- Relatively cheap sensor (microphone)
- Minimal space requirement
- Can also be realized with modified existing ejector pins
- Existing molds can be upgraded with new sensor
- Sensor transferable between molds

Benefits for plastic part manufacturer
- Reduced scrap ⇒ cost reduction
- Tighter dimensional tolerances
- Robust process
- Process documentation
- Online quality control (checking of filled cavities)

Further development
- Cooperation partner for product realization sought
- Type of cooperation to be defined
- Patents granted

Patents
- Further patent publications and patents pending in USA, China, Japan and Korea

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Curious how it works?
Read onto the next page!
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Working principle

- Movable purely mechanical element (actuator) in mold (can be existing modified ejector pin)
- Acceleration of actuator by passing melt front
- Impact of element on mold ⇒ distinct sound
- Transfer of generated sound via solid-borne sound to mold outside surface
- Detection of generated sound by microphone
- Signal processing and filtering of generated sound
- Event of arriving melt front at defined position detected

Proof of principle measurement

- Two-cavity mold with actuator in each cavity
- Two resonant bodies with different resonant frequencies to distinguish the signals from the two actuators
- One microphone on mold surface for sound detection of both signals
- Temperature sensors at same positions to validate the detection of melt front arrival
- Peak A of sound signal corresponds to rising signal of temperature sensor 1
- Peak B of sound signal corresponds to rising signal of temperature sensor 2

Selected publications


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